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FLOOD INSURANCE STUDY

ORIGINAL

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CITY OF DINUBA, CALIFORNIA
TULARE COUNTY

MAY 3, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER-060403

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FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Dinuba, Tulare County, California, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Dinuba to the regular program of flood insurance by the Federal Emergency Management Agency. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1(d). In such cases, however, it shall be understood that the State (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by James M. Montgomery, Consulting Engineers, Inc., for the Federal Emergency Management Agency under Contract No. H-4727. This work, which was completed in December 1980, covered all significant flooding sources affecting Dinuba.

1.3 Coordination

Areas requiring detailed study were identified at a meeting held on May 11, 1978, attended by representatives of the Federal Emergency Management Agency, the study contractor, and the City of Dinuba. Results of the hydrologic analyses for Tulare County were coordinated with the U.S. Army Corps of Engineers, the U.S. Geological Survey, the U.S. Soil Conservation Service, the California Department of Water Resources, and the Tulare County Flood Control District. Preliminary results of the study were presented to the community at a meeting held on September 18, 1980.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Dinuba, Tulare County, California. The area of study is shown on the Vicinity Map (Figure 1).

The limits of study in Dinuba were determined by the Federal Emergency Management Agency with community and study contractor consultation at the meeting on May 11, 1978. It was determined that the nature of flooding in the city could be characterized as shallow flooding, which refers to sheet flow or ponding, with average flood depths of 3.0 feet or less.

The two primary sources contributing to flooding within Dinuba are overflows or breakout flows from Alta East Branch Canal and runoff from the local watershed, including some irrigation ditches. These sources were studied by shallow flooding techniques.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1985.

2.2 Community Description

The City of Dinuba is located in the San Joaquin Valley in northwestern Tulare County, in central California. The total land area incorporated by the city is approximately 1.8 square miles. Dinuba is approximately 27 miles southeast of Fresno, California, and approximately 16 miles northwest of Visalia, California. According to U.S. Bureau of the Census figures, the population has increased from 7197 in 1970 to an estimated 8850 in 1975 (Reference 1).

Alta East Branch Canal flows southeasterly approximately 4.1 miles from the center of Dinuba. It originates at Kings River and distributes water to several irrigation ditches. Because this flooding source is a canal and not a natural stream, it has no associated drainage area. Smith Mountain lies between Dinuba and Alta East Branch Canal, and provides the city with a certain amount of protection against canal overflows and breakouts.

The local watershed which contributes to flooding in Dinuba is comprised of the area between the Dinuba corporate limits and Alta East Branch Canal, and part of the area between Alta East Branch Canal and Friant-Kern Canal. The area of this watershed is 12.0 square miles. There are several small irrigation conveyances operated by the Alta Irrigation District within the watershed which may affect flooding in Dinuba; the two most prominent ones are Dinuba Town Ditch and Smith Mountain Ditch.

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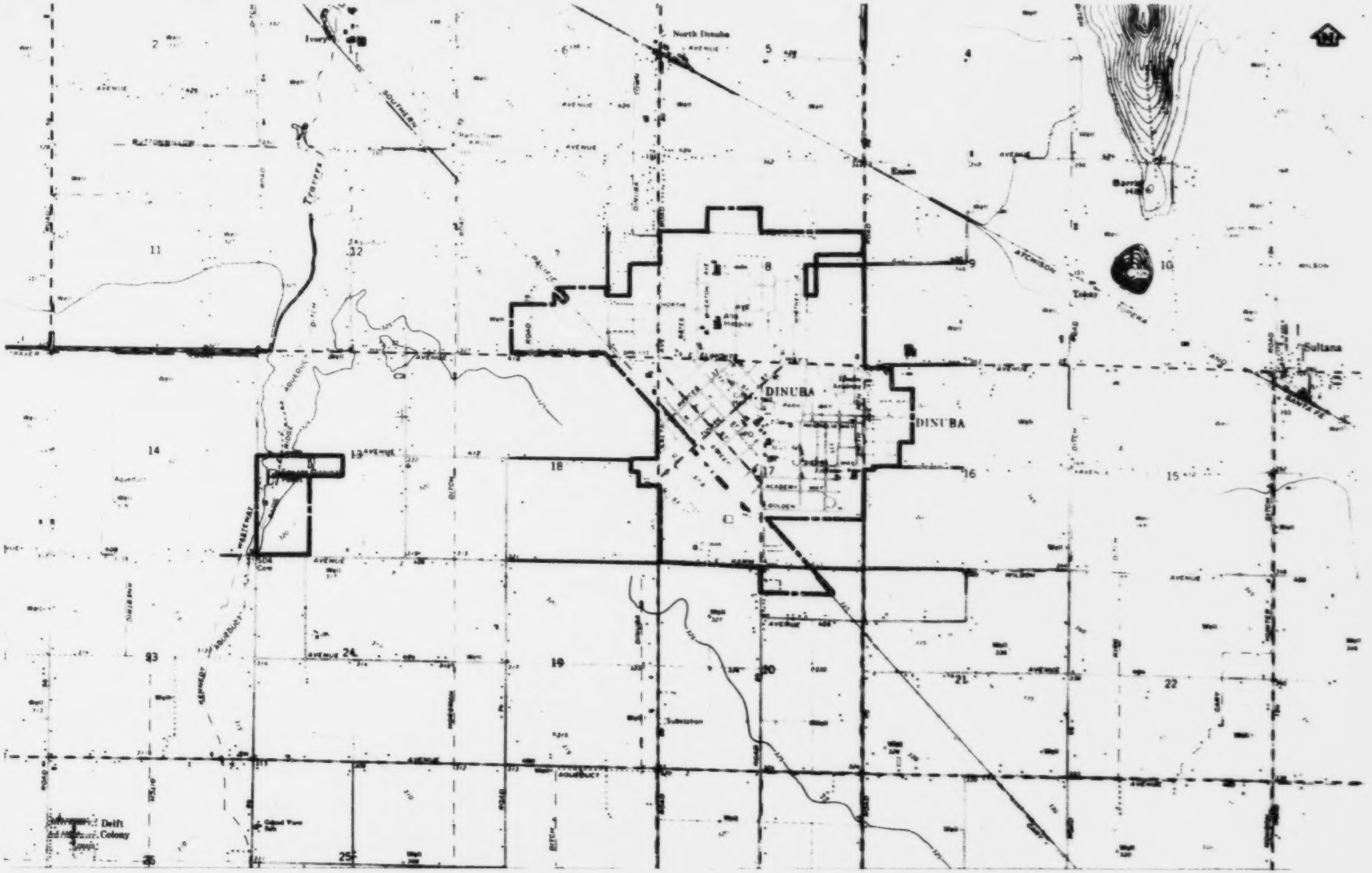

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DINUBA, CA
(TULARE CO.)

APPROXIMATE SCALE

3750 0 3750 7500 11,250 FEET

VICINITY MAP

Development in Dinuba consists primarily of residences and commercial establishments. A large part of the industry is related to agriculture, the dominant business in the San Joaquin Valley. The main transportation arteries serving the city are the Southern Pacific Railroad, Alta Avenue (Road 80), and El Monte Way (Avenue 416). Friant-Kern Canal, a major conveyance facility of the Central Valley Project, is approximately 6.4 miles northeast of the city.

The climate of the area is semiarid and may be classified as interior Mediterranean. Summers are hot and dry, and winters are mild with infrequent snowfall. Temperatures vary from average summer highs near 100°F to average winter lows near 32°F. Average annual precipitation is approximately 11.5 inches, with most falling in the winter and spring (Reference 2).

There are two general soil types in the watershed contributing runoff to Dinuba. One type is found on the valley floor and is a deep, nearly level to gently sloping, moderately well-drained to excessively-drained fine sandy loam. The second is found on Smith Mountain and is a shallow to deep, well-drained coarse sandy loam with rapid runoff. Vegetation on the valley floor is largely determined by agricultural uses, whereas native vegetation on Smith Mountain is comprised of grasses, herbs, shrubs, and trees (Reference 3).

2.3 Principal Flood Problems

The history of flooding in Dinuba suggests that the flood season extends from November through June, with general rain floods usually occurring between November and April, and snowmelt floods occurring from April to June. Cloudburst storms may occur any time from late spring to early fall. Most of the large floods have occurred during December, January, and February, and have been the result of heavy rains combined with snowmelt from the foothills and the Sierra Nevada mountains.

There have been several major floods in the Dinuba vicinity in this century. These occurred in December 1937, November 1950, December 1955, December 1966, and January 1969. The flood of December 1955 caused a peak inflow to Pine Flat Reservoir of 112,000 cubic feet per second (cfs), the largest discharge on Kings River in this century. It resulted in serious flooding in several valley floor communities and caused extensive damage to streets, bridges, and agricultural land (Reference 2). The flood of December 1966 was caused by heavy rainfall combined with snowmelt. Most inundation from this flood affected agricultural land; urban areas in the valley were only slightly affected. The peak inflow to Pine Flat Reservoir was estimated at 91,000 cfs (Reference 4). The January 1969 flood resulted in a peak inflow to Pine Flat Reservoir of 80,000 cfs. Areas of Dinuba were inundated by overflows from flood-fed irrigation canals (Reference 5). In only a few isolated

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parts of the city did the depth of this flooding exceed 2 feet; most of Dinuba had flooding of 1 foot or less.

A primary flooding source in the vicinity of Dinuba has been breakouts of Alta East Branch Canal. In the 1969 flood, this canal experienced two breakouts north of the city, one near the intersection of South and Hill Avenues and one near Monson Avenue. In the flood of January 1978, the flow at Anchor Avenue was estimated at 1000 cfs. The normal capacity of the canal when used for irrigation purposes is approximately 400 cfs. Overflow from Alta East Branch Canal in the vicinity of Monson and Anchor Avenues flows south of Smith Mountain and enters Dinuba from the east and northeast. Breakouts which occur farther north near South and Hill Avenues flow north of Smith Mountain and cause significant flooding problems in the community of North Dinuba; some of this flow enters Dinuba from the north. Approximately 250 cfs of Alta East Branch Canal discharge is assumed to contribute to 100-year peak flooding conditions in Dinuba.

The peak discharge from the local watershed with a 100-year recurrence interval is estimated to be 1850 cfs. This discharge includes potential overflow from Smith Mountain Ditch and Dinuba Town Ditch. The general slope of the area is to the southwest, and its runoff joins Alta East Branch Canal overflows and enters the city from the northeast.

Although Kings River flows within 5 miles of Dinuba, it has historically posed no direct threat to the city. However, it may affect the amount of water flowing in Alta East Branch Canal, which in turn affects flooding in Dinuba. In addition, there is no historical evidence of breaching or overtopping of Friant-Kern Canal in the vicinity of Dinuba, and thus it is assumed to pose no threat to the city with respect to floods with recurrence intervals of 100 years or less.

2.4 Flood Protection Measures

The primary flood protection facility affecting flooding in the northern part of the Tulare Lake basin is Pine Flat Dam on Kings River, which was completed in 1954. Pine Flat Reservoir has a gross capacity of approximately 1,000,000 acre-feet. This dam has reduced potential flood hazards on Kings River and its distributaries, but it only affords protection to Dinuba insofar as it may reduce the frequency with which Alta East Branch Canal is filled to capacity with Kings River floodflows.

Alta East Branch Canal, which is confined by parallel levees, constitutes a significant obstruction to runoff from part of the local watershed. Levee openings are too small to permit passage of peak discharges, and ponding behind the levees further diminishes the peaks. The valley floor surrounding Dinuba is essentially

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flat, and thus levee irrigation ditches and embankments for roads and railroad tracks may also serve to divert or contain floodflows.

A flood control master plan published by the Tulare County Flood Control District in 1971 did not consider the sources of shallow flooding in Dinuba, and thus presented no recommendations for alleviating flooding in the community (Reference 6). Under certain flooding conditions, the Alta Irrigation District attempts to avoid breakouts on main irrigation channels by distributing the flow to a system of small lateral ditches such as Dinuba Town Ditch and Smith Mountain Ditch. However, these lateral ditches frequently fail and cause local flooding problems. Several persons in the community suggested that flooding problems within the city have worsened as more and more land surrounding Dinuba has been leveled to accommodate increased agricultural development.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

Due to the fact that only shallow flooding affects this community, only the 100-year flood was analyzed.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the magnitude of the 100-year flood for each flooding source affecting the community.

Runoff from the local watershed was estimated using regional regression equations developed for California watersheds by the U.S. Geological Survey (Reference 7). These equations relate drainage

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area, mean annual precipitation, and a basin elevation index to peak discharges. The drainage area of approximately 12 square miles assumed to contribute to flooding in Dinuba includes Smith Mountain, the valley floor area between the Dinuba corporate limits and Alta East Branch Canal, and part of the area between Alta East Branch Canal and Friant-Kern Canal. The 100-year peak discharge from this watershed is estimated to be 1850 cfs.

Alta East Branch Canal contributes to flooding in Dinuba as a result of levee breeches and overflows. Because a detailed analysis of levee failures was beyond the scope of this study, historical information, particularly that pertaining to the January 1969 flood, was used to estimate the location and severity of canal breakouts affecting Dinuba. The primary levee failure was assumed to occur in the vicinity of Monson and Anchor Avenues, and was assumed to contribute approximately 250 cfs to the peak 100-year floodflow in Dinuba. It was also assumed, based on historical reports, that a levee failure would occur near South and Hill Avenues. Flow from this point causes significant flooding in the community of North Dinuba, and also contributes to sheet flow and ponding along Alta Avenue in northern Dinuba. The hydrology of this breakout was not studied in detail due to the relatively minor impact it would have on shallow flooding within Dinuba.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in the community were carried out to provide an estimate of the depth of the 100-year flood within the community.

Depths of shallow flooding throughout Dinuba were computed using historical information, topographic data, and normal-depth calculations. Cross sections and spot elevations used in this analysis were obtained by photogrammetric techniques from aerial photographs taken in March 1979 (Reference 8).

Due to the methods of analysis, historical information obtained from community officials and other persons was significant in determining flood-prone areas. The flood of January 1969 was adopted as as approximation of the 100-year flood. Computed flow paths and flood depths were compared with historical flooding accounts whenever possible. In addition, the Flood Hazard Boundary Map for the City of Dinuba (Reference 9) was used to identify potential flood-prone areas.

Roughness factors (Manning's "n" values) used in the hydraulic computations were chosen by engineering judgment and based on field observations. Roughness values were 0.015 for paved streets and 0.080 for residential areas.

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Water-surface profiles are not applicable to areas of shallow flooding; therefore, no flood profiles were prepared for this study.

The hydraulic analyses for this study were based on unobstructed flow. The flood depths shown on the maps are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail. In addition, it has been assumed that breakouts of Alta East Branch Canal will occur in the vicinity of past breakouts.

Shallow flooding is often characterized by highly unpredictable flow directions, caused by low relief or shifting channels and high debris loads. Where such conditions exist, the entire area susceptible to this unpredictable flow was delineated as a zone of equal risk. Small-scale topographic variations were averaged across inundated areas to determine flood depths.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD).

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Emergency Management Agency as the base flood for purposes of flood plain management measures. The boundaries of the 100-year flood have been delineated using the flood elevations determined at cross sections and spot elevations; between points of known elevations, flood boundaries were interpolated by hand, using aerial photographs at a scale of 1:4800 (Reference 8).

Flood boundaries are indicated on the Flood Insurance Rate Map (Exhibit 1). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zone A0). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

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4.2 Floodways

The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights.

The special flood hazard areas in Dinuba are areas of shallow flooding; therefore, the concept of a floodway is not applicable to this community.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Emergency Management Agency has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source studied in detail affecting Dinuba.

5.1 Reach Determinations

Because flooding in Dinuba is shallow, the area does not lend itself to standard reach determinations as defined by the Federal Emergency Management Agency. Consequently, none were developed in these areas, and flood insurance zones were assigned directly based on the type of flooding conditions present in the community.

5.2 Flood Hazard Factors

The FHF is the Federal Emergency Management Agency device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

Flood Hazard Factors are derived from standard reach determinations and, therefore, do not apply to Dinuba.

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5.3 Flood Insurance Zones

The entire incorporated area of Dinuba was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A0:	Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; depths are shown, but no FHFs are determined.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

The flood insurance zones studied in the community are summarized in Table 1.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Dinuba is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Emergency Management Agency.

6.0 OTHER STUDIES

A Flood Hazard Boundary Map for the City of Dinuba was published by the Federal Emergency Management Agency in 1974 and revised in 1976 (Reference 9). Differences between the Flood Hazard Boundary Map and this study are due to the availability of more complete and detailed topographic information and updated hydrologic data used in this study.

A Flood Insurance Study for the unincorporated areas of Tulare County is being prepared by the Federal Emergency Management Agency (Reference 10). The results of this study match the Dinuba Flood Insurance Study exactly.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Shallow Flooding	0001	N/A	N/A	N/A	N/A	AO	Depth 1
Shallow Flooding	0001	N/A	N/A	N/A	N/A	AO	Depth 2

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DINUBA, CA
(TULARE CO.)

FLOOD INSURANCE ZONE DATA

SHALLOW FLOODING

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Federal Emergency Management Agency, Natural and Technological Hazards Division, 211 Main Street, Room 220, San Francisco, California 94105.

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